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Directorate of
Intelligence

Confidential

China's Growing Export Competitiveness

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A Research Paper

Confidential

EA 83-10137
August 1983

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Errata

Notice to recipients of DDI document: *China's Growing Export Competitiveness,* EA 83-10137, Confidential, August 1983. [redacted] 25X1

The attached graphic is to replace the incorrect graphic on page 25. [redacted] 25X1

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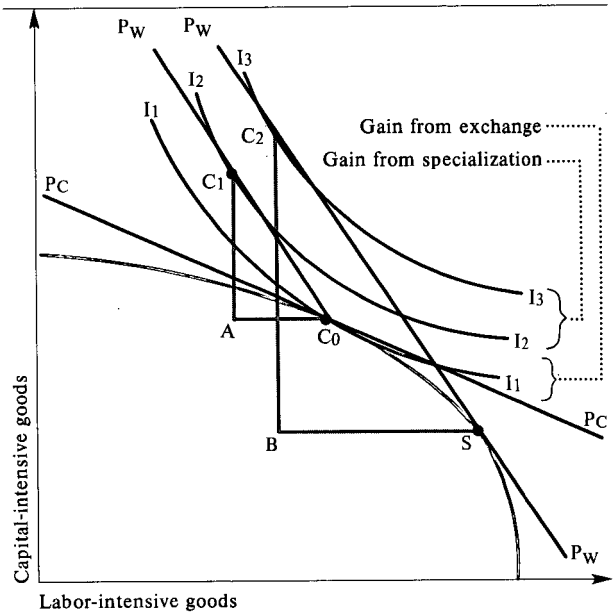
Figure 4
Economic Benefits of Trade



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A Research Paper

This paper was prepared by
China Division, Office of East Asian Analysis.
Comments and queries are welcome and may be
directed to the Chief, Development Issues Branch,
OEA,

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China's Growing Export Competitiveness

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Summary

Information available as of 1 July 1983 was used in this report.

Since the death of Mao Zedong, China's leaders have become more outward looking in their strategy for China's economic development. Not only have they accepted foreign investment and loans, they also have come to view foreign trade as an engine of growth.

Beijing's dual programs of economic "readjustment" and "reform," announced in early 1979, complement its new policy of greater openness to the West. The readjustment policy aims at reducing investment in capital-intensive heavy industry and boosting output of labor-intensive light industry. This will make China more competitive in the world market. Reform policies, on the other hand, were designed to improve the functioning of markets. This program has encountered many problems in the foreign trade area, primarily because domestic prices do not reflect the free interplay of supply and demand. Instead of returning to direct central controls over foreign trade, however, Beijing has attempted to use "economic levers"—including export tariffs and quotas—to remedy these malfunctions. It has yet to resolve the conflicts between its plan goals and the dictates of the market.

This paper examines the relationships between China's exports and domestic factors of production—land, labor, capital, and resources. We find that, despite the microeconomic deficiencies of the present system, China's trade patterns are becoming more rational. China increasingly is doing what a comparably endowed free market economy would do: exporting labor- and resource-intensive goods and importing capital-intensive goods. Nevertheless, China's domestic economy is still geared toward the production of capital-intensive goods, a legacy of China's past pursuit of the Stalinist model of development. Failure to specialize in the production of labor-intensive goods has diminished China's potential gains from trade.

In the past, the Chinese viewed exports solely as a means of paying for imports. Now Beijing is finding additional reasons to expand exports. During the current five-year plan (1981-85) China must absorb nearly 100 million new people into its labor force—a number equal to the present size of the total US labor force. Under pressure to raise living standards quickly, Beijing realizes that expanding production and export of labor-intensive goods is one of the best ways to boost real wages and, therefore, Chinese living standards.

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Based on the model we developed for this paper, we have estimated the effect on exports of changes in China's capital stock, employment, and output during the current five-year plan. Those factors, which explain about 60 percent of the pattern of China's exports, suggest that between now and 1985:

- China's exports of machinery and equipment—in particular, household equipment, electronics, and precision instruments—will experience the largest percentage growth.
- China will capture a slightly larger share of the world textile and apparel market than its current 7 percent.
- China's exports of oil are likely to fall as the rate of growth of output declines and capital costs increase.

Although China's growing involvement in world trade will help to alleviate its own growing pains, China's increasing export competitiveness may create problems for the rest of the world. Domestic US producers have already filed complaints with the US International Trade Commission alleging unfair Chinese trade practices on sales of a variety of commodities. Chinese efforts to gain a greater share of world market—now only 1 percent of the total—will cause increasing friction with its LDC competitors as well.

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China's Growing Export Competitiveness [1]

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Introduction

In the past seven years China has moved steadily toward greater participation in the world economy. Beijing has overcome its ideological aversion to both foreign debt and foreign investment, established more extensive trade relations with the West, joined the International Monetary Fund and World Bank, decentralized its trade organizations, and sent thousands of students abroad to obtain Western educations.

More importantly, fundamental Chinese attitudes about the role of trade in a planned economy are changing. Imports are no longer viewed solely as an instrument to serve the direct needs or interests of the central government; they are increasingly being used as a means of directly satisfying consumer needs. Exports are no longer seen purely as a means of paying for imports but also as a dynamo for domestic economic development.

Beijing is seeking an infusion of Western technology into its export industries in order to help modernize industry at large. By encouraging China's sleepy domestic industries to compete to sell goods in Western markets, the leadership hopes to improve the quality of goods produced for the domestic market as well.

Beijing is also becoming aware of the benefits to employment of expanding exports. Within the current five-year plan China must absorb nearly 100 million new workers into the labor force—equal to the present size of the total US labor force. Productivity and wage rates are much higher in the export sector than elsewhere. Promoting exports will help to alleviate the massive problem of finding jobs and raising living standards for the people.

[1] Although this paper provides a forecast of Chinese export growth, much of the paper is not focused directly on the estimate, but rather on its analytical foundations. As much as possible, supporting technical material has been put in appendixes. But there is more methodological scaffolding left in the body of the text than there is in most of this Directorate's published product. Our intent is to share with the reader the analytical foundations of one approach to understanding Chinese foreign trade

Table 1
Selected Countries:
Share of GNP From Exports, 1981

	Percent
Saudi Arabia	95.2
Taiwan	50.4
South Korea	41.2
West Germany	32.1
Indonesia	27.5
Japan	16.6
United States	9.6
Brazil	9.1
USSR	8.8
India (1979) [a]	7.3
Turkey (1978) [a]	5.5

[a] Latest available data.

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The Chinese are no longer content to export a little of everything they produce. Instead, they are beginning to realize that, in order to maximize the gains from trade, they must shift the pattern of domestic production into labor-intensive industries. They are aware that increasing specialization of production will entail much greater dependence on the rest of the world.

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Trade Patterns Under the Stalinist Model

This new attitude contrasts sharply with Beijing's earlier goal of becoming self-reliant. During the first 30 years of Communist rule, China severely limited its participation in the international economy: China's share of world trade dropped from its prewar peak of almost 2 percent to less than 0.5 percent. Before 1979, China never derived more than 3 percent of its GNP from exports, probably the smallest proportion for any country (see table 1).

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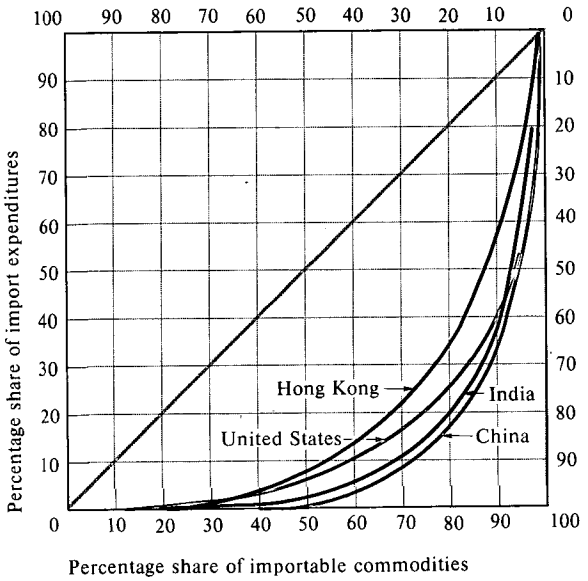
The foreign trade behavior of centrally planned economies traditionally has been marked by a high degree of self-sufficiency, currency inconvertibility, discrimination, and bilateralism. Under Mao, China certainly displayed the first three characteristics, but Beijing's break with the Soviet Bloc in 1960 significantly diminished the role of bilateral barter arrangements in its foreign trade. [2] These trading characteristics result naturally from other common features of these economies, namely "irrational" internal price structures [3] and exchange rates, state trading, overcommitment of resources, quantity targeting, and the system of material balances.

Irrational pricing was a major deterrent to trade. Following the Marxist "labor" theory of value, China's Bureau of Commodity Prices often set prices at levels that did not fully account for rent, interest, and depreciation costs. These administered prices were insensitive to fluctuations in supply and demand. As a result, the price structure did not reflect real costs, but instead contained implicit subsidies and taxes. Under these circumstances, free trade and currency convertibility could not be allowed. Permitting foreigners to trade freely at domestic (subsidized) prices would have produced windfall gains for the foreigners and equally large losses for China. Therefore, state corporations were given exclusive control over trade.

State trading had two important consequences for the pattern of China's trade. First, foreign trade was conducted primarily to obtain imports the state considered essential. Consumer goods did not count heavily in the planners' calculations. As a result, China's imports were more concentrated than they would have been in a market setting. Figure 1 compares the degree of concentration of China's imports in 1975 with those of several market economies, using Lorenz curve techniques. [4] Steel, heavy machinery, nonferrous metals, fertilizers, grain, and textile fibers accounted for nearly 85 percent of China's foreign exchange expenditures.

Second, under state trading, the only rationale for exporting was to earn enough foreign exchange to finance needed imports. Lacking other incentives to export, the Chinese lapsed into viewing exporting as a means of unloading unwanted domestic goods, and hence they showed little concern for improving the quality of their exports or penetrating new markets. As a result, exports were dispersed across a variety of commodities and markets. Figure 2 compares the degree of concentration of China's exports with those

Figure 1
Selected Countries: Distribution of Import Expenditures, 1975


Percentage share of import expenditures
Percentage share of importable commodities
Hong Kong
India
United States
China
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100

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[2] By 1981 China's barter trade with other Communist countries had fallen to only 6 percent of China's total trade.

[3] That is, prices that fail to reflect the true costs of production.

[4] Two-digit SITC commodities were ranked in terms of the amount of foreign exchange spent on them, and cumulative expenditure shares are measured on the vertical axis. A diagonal across the Lorenz box would indicate that an equal amount of foreign exchange was spent on each two-digit commodity group.

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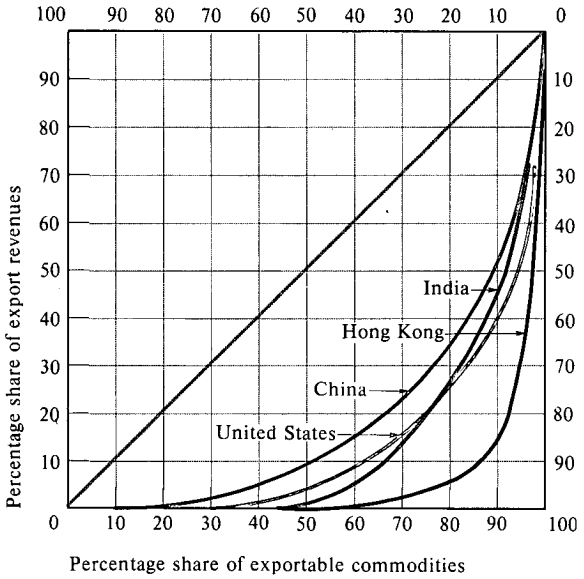
Figure 2
Selected Countries: Distribution of Export Revenues, 1975


100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
Percentage share of export revenues
Percentage share of exportable commodities
India
Hong Kong
China
United States

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of several market economies. China's exports were not only more diversified than those of any market economy we examined, but also more diversified than its own imports—perhaps a unique case.

Moreover, Chinese planners actively tried to diversify exports, because this policy offered the perceived benefit of minimizing risks. Adverse foreign economic situations could have little impact on China's foreign trade plans, since no single commodity accounted for more than a small share of foreign exchange earnings. Furthermore, the planning authorities knew that even if the wrong commodities were exported the losses resulting from the misallocation of resources would be small compared with the clear gains from needed imports.

Beijing also pursued "overfull employment planning." Taut planning led to a seller's market and to a lack of concern for the quality of output. The resulting excess demand by consumers for final products and by enterprises for factors of production and intermediate products expressed itself either as open or repressed inflation. Over time, the Chinese found that they were sustaining greater and greater losses on exports—and profits on imports—at the official exchange rate. These factors worked together to reduce the incentives for expanding exports. 25X1

Quantity targeting and the system of material balances also have contributed to China's autarkic bias. Because of the complicated input-output relationships between intermediate and final products, planners tried to avoid becoming dependent on foreign supplies in order to insulate the domestic economy from the vagaries of the world market. Moreover, the use of quantity targeting in foreign trade often led to perverse economic results, depending on whether "quantities" were expressed in physical or foreign exchange units. 25X1

On the export side, if a certain physical quantity of goods was earmarked for export, China's foreign trade corporations (FTCs) strove to export that precise amount, regardless of world price fluctuations. As a result, the Chinese moved slowly to expand supplies available for export when world prices increased. In fact, for many export commodities, the Chinese response was just the opposite—perhaps an indication that China engaged in "foreign exchange targeting." If the price of a commodity increased significantly, earnings apparently exceeded the foreign exchange target sufficiently that the FTCs could reduce the physical quantities exported. Conversely, if the price fell, the Chinese ended up exporting more in order to meet their target for foreign exchange earnings from the particular commodity.[5] The FTCs, of course, could only maintain this sort of perverse, backward-bending supply curve behavior in the short run. Over

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the longer term, presumably, the Chinese would have adjusted their plans so as to export smaller quantities of commodities suffering from secularly declining prices.

On the import side, however, this sort of "foreign exchange rationing" appeared to increase Chinese sensitivity to changes in foreign prices and led to exaggerated quantity responses—if foreign prices rose, the Chinese immediately cut purchases in order to keep foreign exchange outlays from exceeding the allotted amount. Perhaps because of China's policy of self-reliance (particularly, its unwillingnesss to accept foreign debt), the Chinese were reluctant to run trade deficits and, hence, overreacted to changes in import prices, especially increases.

In the absence of reliable market signals, politics often intruded into decisions on how much and what commodities China ought to trade. Internal debate over whether China should export oil, for example, cropped up shortly after OPEC's initial price hike in early 1973 substantially boosted the opportunity cost to China of not selling its oil abroad. This was one of many international economic issues that divided the "radicals" and the "moderates" in Beijing prior to the death of Mao Zedong in 1976.[6]

Trade Policies in the Post-Mao Period

Mao's successors, led by Deng Xiaoping, have taken major steps to change the economic system. The changes instituted since late 1978 have fallen under the rubric of either economic readjustment or economic reform. Under the readjustment program, China's overall macroeconomic goals were completely reevaluated. Investment was to be scaled back in favor of more consumption; heavy industry, the focus of both trade and domestic economic policy before 1979, was to be deemphasized in favor of light industry and agriculture. By diverting funds from heavy to light industry, the Chinese expected to reap a larger return on investment, and in much less time. The reform program, on the other hand, attempted to tackle microeconomic problems by making enterprises responsible for their own profits, promoting price reforms, and changing work incentives. These reforms would permit the development of a framework of rules capable of giving China more marketlike signals. 25X1 25X1

The Chinese also began to rethink their export policies. Articles in the Chinese press extolled the economies of Japan, South Korea, and Taiwan—countries which developed through the promotion of export industries. Chinese economists called for the country to specialize along the lines of its comparative advantage—labor-intensive industries—in order to maximize the gains from trade. 25X1

These policy changes have had a major impact on China's foreign trade. From 1977 to 1981 China's exports grew at a rate of over 25 percent a year, second in the world only to Mexico, where vast oil discoveries spurred exports. China's exports now account for between 5 and 7 percent of its GNP, and more than 1 percent of world trade. 25X1 25X1

The readjustment has resulted in a sharp reduction in imports of machinery and transport equipment, steel, nonferrous metals, and other supplies for heavy industry. Imports of consumer goods and supplies for light industry, on the other hand, have increased significantly. The readjustment has had a similar—but less apparent—impact on the export side. The proportion of heavy industrial exports has declined, while that of light industry has risen. Under the readjustment, China's exports have become much more concentrated, while imports have become more diversified [7] (see figure 3). 25X1 25X1

On the other hand, the introduction of the economic reform package, with its emphasis on making individual enterprises responsible for their own profits and losses, has created major problems for the Chinese. Although the overall goal of the program was to

[6] For a discussion of these economic debates see Richard E. Batsavage and John L. Davie, "China's International Trade and Finance." *The Chinese Economy Post-Mao.* United States Congress, Joint Economic Committee. Washington, D.C.: US Government Printing Office, 1978), pp. 720-726. 25X1

[7] This is in keeping with the Heckscher-Ohlin trade theory in a multicountry, multicommodity framework. See Richard E. Caves and Ronald W. Jones, *World Trade and Payments*, 2nd ed., pp. 116-126, (Boston: Little, Brown and Co., 1973) for an explanation of the theory. 25X1

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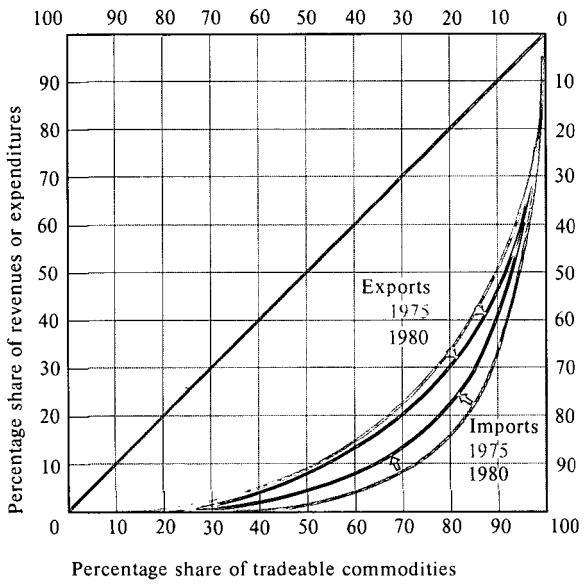
Figure 3
China: Distribution of Export Revenues and Import Expenditures, 1975 and 1980



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decentralize decisionmaking, Beijing has had to shuffle lines of authority continuously in an effort to deal with an irrational domestic price structure and exchange rate.

Initially, in 1980, Beijing found that at the official exchange rate of 1.5 yuan per dollar local producers quit exporting many commodities that the Ministry of Foreign Trade had previously exported because those commodities were no longer profitable. On the other hand, importing became much more attractive. Many enterprises purchased a variety of consumer products in the Hong Kong market for distribution to their employees—watches, pocket calculators, televisions, and motorcycles. Others began searching abroad for equipment purchases. By late 1980, China had developed a sizable trade deficit.

Beijing therefore took steps to remedy these market malfunctions, first, by providing enticements for enterprises to boost exports, and, second, by removing incentives to import. In early 1981 municipal and provincial enterprises were granted the authority to retain up to 30 percent of foreign exchange earnings for their own use. At the same time Beijing established a more favorable "internal" yuan-dollar exchange rate of 2.8 to 1 (compared with the official rate) that would permit domestic firms to earn larger profits on exports. This "internal settlement" rate also acted to curb imports. And at the end of March 1981 Beijing imposed foreign exchange controls on local enterprises, which required them to deposit all their foreign exchange earnings with the Bank of China, thus cutting off an uncontrolled source of spending.

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These policy changes immediately altered China's trade balance. Beijing converted a $500 million first-quarter deficit into a $1 billion second-quarter surplus. For the past seven quarters the Chinese have averaged surpluses of $1.5 billion per quarter. Despite this success, Beijing found that the higher 2.8-yuan-per-dollar exchange rate was not a panacea for all its trade ills.

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Local producers, whose domestic costs were subsidized, began to cut their export prices in an effort to sell their goods abroad; they also tended to pay higher prices for imports than before, when the Ministry of Foreign Trade handled all negotiations. As a result, China's terms of trade, a key indicator planned economies use to determine the efficiency of foreign trade, began to deteriorate. Furthermore, shortages began to appear for commodities that were underpriced domestically: small producers siphoned off scarce resources for processing into exports, competing with large, efficiently run firms for foreign exchange.

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In short, the decentralization of foreign trade, in the absence of a rational internal price structure, may not have yielded any better results than the more centralized system that preceded it. China, however, has not scrapped its reform efforts. Instead of returning to a system of direct central administration of foreign

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trade, Beijing has attempted to use "economic levers" to influence the behavior of independent domestic enterprises. In March 1982 China instituted a new system of tariffs, covering about 10 percent of its exports, which was designed to raise the foreign exchange prices of commodities that local producers had previously cut. In June, Beijing also established an export-licensing scheme, administered by the new Ministry of Foreign Economic Relations and Trade (MFERT), which allocated export quotas among producers in order to prevent domestic shortages. Beijing also imposed restrictions on imports of certain Western consumer goods in order to protect its domestic industries. In April 1983 Beijing revised its tax codes and tariffs on joint ventures in order to eliminate certain distortions that had become apparent in the previous regulations.

In a market economy, such measures would represent an intrusion of the central government into the operations of the market and would themselves cause a distortion of the optimal allocation of resources. For China, however, these measures probably should be viewed as a "second best" solution, pending a major realignment of domestic prices. Beijing clearly wants to use these measures to encourage a pattern of trade and domestic production that reflects China's economic conditions—its masses of low-paid workers and abundance of natural resources and its scarcity of arable land, advanced technology, and capital.

China's Comparative Advantage [8]

In order to assess how far China has progressed toward a market pattern of foreign trade, we will compare the composition of China's industrial exports in 1981 with the pattern that would be predicted by the Heckscher-Ohlin model of foreign trade.[9] That model postulates that, under certain restrictive assumptions, a market economy will export commodities whose production requires relatively intensive use of productive factors—land, labor, capital, and resources—found locally in relative abundance. That same economy will import commodities that require relatively intensive use of the country's scarce factors of production. 25X1

The Heckscher-Ohlin model of foreign trade, however, is essentially a supply-side model—and demand conditions can significantly alter the trade patterns predicted by it. For example, if a country has a natural production bias toward capital-intensive goods because it possesses large endowments of capital relative to labor, that country may still end up importing capital-intensive goods because of heavy domestic demand for such goods. The results depend on how relative factor abundance is defined. Only if factor abundance is defined in terms of relative factor prices [10] does it necessarily follow that a capital-rich country will export capital-intensive goods and a labor-rich country will export labor-intensive goods. If, instead, factor abundance is defined in terms of physical endowments, it is still true that a capital-rich country must produce relatively more of the capital-intensive goods, but it will not necessarily export them. 25X1 25X1

By either definition, China is a labor-rich, capital-poor country. Table 2 compares China's labor force with that of the OECD and CEMA countries for 1979. China's 400 million workers equal more than four-fifths the combined labor force of the OECD and CEMA countries. In absolute terms, China has more people employed in industry than any other country of the world. But in relative terms, only a small portion of the total labor force works in industry. Reflecting China's status as a less developed country, nearly three-fourths of the labor force is employed in the agricultural sector, in sharp contrast to the OECD countries (where less than 10 percent are so employed) and the CEMA countries (less than one-fourth). Furthermore, China's services sector is relatively small in comparison to those of the OECD and CEMA countries, where services employ over half of the total labor force. 25X1 25X1 25X1

[8] The principle of *comparative* advantage contradicts the commonly held notion that it is necessary for a country to have an *absolute* advantage in productivity in some product in order to be competitive. Even in the extreme case of a country that is absolutely less productive than any other country in all lines of production, that country will still gain from trade by exporting those goods that it produces the least inefficiently and importing those goods it produces most inefficiently.

[9] We have chosen 1981 for this study because it is the year for which the best cross-sectional data for Chinese industries are available.

[10] In other words, scarce factors command relatively high prices whereas abundant factors receive relatively low rewards. 25X1

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Table 2
Comparative Labor Forces, by Sector, in 1979

	Agriculture		Industry		Services [a]		Total	
	Million Workers	*Percent of Total*	*Million Workers*	*Percent of Total*	*Million Workers*	*Percent of Total*	*Million Workers*	*Percent of Total*
China	**299.3**	**74**	**53.4**	**13**	**53.1**	**13**	**405.8**	**100**
OECD Countries	**24.1**	**9**	**78.8**	**29**	**169.9**	**62**	**272.8**	**100**
Of which:								
US	3.9	4	21.9	22	71.8	74	97.6	100
Japan	5.7	10	13.4	25	35.7	65	54.8	100
EC	14.0	13	40.6	37	55.4	50	110.0	100
CEMA Countries	**47.2**	**23**	**53.1**	**26**	**102.9**	**51**	**203.2**	**100**
Of which:								
USSR	32.7	23	36.4	25	76.1	52	145.2	100
East Asian LDCs	**61.9**	**54**	**20.3**	**17**	**33.2**	**29**	**115.4**	**100**
Of which:								
Taiwan	1.4	22	2.8	42	2.5	37	6.7	100
Hong Kong	0.1	3	1.4	57	0.9	40	2.4	100
Singapore	NEGL	2	0.4	38	0.7	60	1.1	100
South Korea	5.1	36	4.3	30	4.8	34	14.2	100
Indonesia	28.8	59	5.9	12	14.2	29	48.9	100
Malaysia	2.0	51	0.7	16	1.3	33	4.0	100
Philippines	7.6	47	2.8	17	5.8	36	16.2	100
Thailand	16.9	77	2.0	9	3.0	14	21.9	100

[a] Services include: construction, transportation, telecommunications, trade, public utilities, finance, and official organizations.

Sources:
China: See footnote on table 3 *infra*. OECD and CEMA Countries:
[redacted] East Asian LDCs: World Bank, *World Development Report, 1981* and ILO, *Yearbook of Labor Statistics, 1981*. Taiwan: Republic of China, *Statistical Yearbook, 1981*.

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[redacted]

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Lack of capital is largely to blame for the low level of labor productivity in China. Table 3 shows the distribution of labor, capital, and output by major sector in 1979. The overall capital-labor ratio of $770 per worker [11] is on the order of one-fiftieth that of the OECD countries and less than one one-hundredth the amount of capital employed with the average US worker. Nevertheless, the average worker in China produces roughly $970 worth of goods per year—one-thirtieth that of his US counterpart. His average wage—excluding various subsidies—amounts to about $500 per year, or roughly 20 cents per hour. [redacted]

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The data in table 3 suggest the economic reasons why the leadership embarked in 1979 on a program to reduce investment in heavy industry while increasing

[11] Capital stock and output data for 1979 have been converted to US dollars at the official exchange rate of 1.555 yuan per US dollar. These figures are presented only as an indicator of the order of magnitude because we do not have an accurate exchange rate for comparing social welfare. If the "internal settlement" rate of 2.8 yuan per dollar were used to convert the data, the capital and output figures would be about half those used in the text. [redacted]

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Table 3
China's Capital Stock, Labor Force, and Output in 1979

	Labor Force (*million*)	Capital Stock (*billion yuan*)	Gross Output Value (*billion yuan*)
Agriculture	299.3	97.7	158.4
Industry	53.4	325.3	459.1
Heavy Industry	35.2	288.3	261.1
Light Industry	18.2	37.0	198.0
Services	53.1	145.6	NA

Sources: *Zhongguo Jingji Nianjian,* 1981 (Almanac of China's Economy for 1981), published by Jingji Guanli (Economic Management Magazine Press), edited by Xue Muqiao, Ma Hong, Chen Xian, et al., as translated in Joint Publications Research Service, *China Report: Economic Affairs.*

Data for "labor force" are from table on "Population and Natural Resources," p. 24.

Data for "capital stock" are from table on "Original Value of Fixed Assets of Enterprises Owned by The Whole People at End of Year," p. 32. Data for heavy and light industry estimated from data for investment in fixed assets for 1952-79 in table on "Capital Construction Situation," p. 54. These figures are not for total capital stock, but only for capital owned by state-run enterprises. The figure for agriculture capital stock is for 1978 and is from Nicholas R. Lardy, *Agriculture in China's Modern Economic Development,* p. 143, and includes both state and collective sectors.

Data for "gross output value are from table on "Major Indexes of National Economy (Absolute Figures)," p. 26.

the amount of capital made available to light industry: the capital-output ratio in heavy industry was 1.1:1, whereas in light industry, only about 0.2:1. In other words, to produce 1 yuan's worth of heavy industrial products in 1979 required 1.1 yuan in capital. One yuan of output from light industry could be produced with only 0.2 yuan in capital—five times the return from 1 yuan invested in heavy industry.

Unfortunately, aggregate measures are not available for international comparisons of resource abundance. The low level of arable land per agricultural worker in China—one-third hectare—of course dictates a labor-intensive form of agriculture. It follows that any exports from that sector should be of the labor-intensive variety—mushrooms, rice, truck farming, and so on. In absolute terms—as opposed to a per capita basis—China possesses some of the world's largest untapped reserves of iron ore, coal, copper, tin, tungsten, antimony, mercury, molybdenum, gallium, and fluorspar, as well as significant reserves of petroleum, bauxite, nickel, lead, titanium, tantalun, vanadium, bismuth, and manganese. Moreover, China's nonmetallic mineral deposits are sizable. Therefore, China probably can best be characterized as having a comparative advantage in producing both labor-intensive and certain resource-intensive commodities. 25X1

Table 4 ranks China's industries by capital intensity, in low to high order. Because the Chinese economy is undoubtedly one of the most labor intensive, the list ranks industries according to China's comparative advantage. [12] The exceptions would be for those industries in which China has large endowments of natural resources, such as oil and coal, where exploitation costs are a direct, inverse function of the abundance of the commodity. A cursory examination of the list suggests there is some degree of negative correlation between the capital intensity of China's industry and China's export share of the world market: China's market share tends to be greater the more labor intensive the industry. In appendix A we have used regression analysis to measure these relationships quantitatively. 25X1

Our calculations suggest that at least 25 percent of Chinese trade behavior conformed to the Heckscher-Ohlin predictions. The regression equation we have estimated for 1981 shows that as the labor intensity of domestic production increased so did exports. (Alternatively, as capital intensity increased exports contracted.) Exports also tended to vary positively with the availability of natural resources. The availability of a variety of natural resources reduced exploitation costs and, in turn, gave China a comparative advantage in the world market. 25X1 25X1

[12] Ranking goods according to the factor intensities with which they are produced is the equivalent of ranking them according to comparative advantage. For a proof of this assertion see Bo Sodersten, *International Economics,* 1st Edition, (Harper & Row, Publishers, 1970), pp. 73-75. 25X1

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Table 4
China: Exports, Ranked by Capital Intensity [a]

Chinese Industrial Code	Branch of Industry	Capital-Labor Ratio *(thousand RMB/worker)*	1981 Exports	
			Million US $	*Percent Share of World Trade*
25	Metal products for household use	1.6	362.1	1.9
31	Ceramics	1.9	29.3	1.0
38.6	Tobacco manufacturers	2.1	3.6	0.1
40	Clothing	2.1	2,013.7	6.4
38.1	Slaughtering and meat processing	2.4	380.3	2.2
38.3 *	Canned foods	2.8	628.7	7.7
39.3 *	Cotton textiles	2.9	933.3	18.6
41	Leather	3.0	516.2	3.0
30	Glass	3.5	9.8	0.4
39.- *	Textiles other than cotton or synthetic	3.6	1,819.2	6.4
32 *	Nonmetallic mineral products	3.6	48.5	4.2
43	Educational and cultural articles	3.8	690.4	1.8
36 *	Grain and food oil	4.2	614.5	4.5
39	Fire-resistant building materials	4.2	10.1	0.2
38 *	Miscellaneous food products	4.5	531.9	1.7
34-35	Wood products	4.6	586.9	2.3
17	Agricultural machinery	5.0	6.6	0.1
33	Timber felling and transport	5.4	10.0	0.2
22	Electronic apparatus	5.5	123.1	0.2
—	Finished chemical products	5.6	378.1	1.1
21	Precision instruments and other equipment	5.7	141.3	0.2
44	Miscellaneous goods	6.0	965.8	5.0
14	Chemicals for household use	6.0	93.9	0.8
6 *	Coal	6.2	249.2	1.6
11.2	Chemical pesticides	6.6	17.9	0.5
28 *	Bricks, tile, lime, and other building material	6.8	77.8	3.1
42	Papermaking	6.9	174.0	0.5
38.8	Distilling	7.1	39.6	0.6
	Miscellaneous machinery and metal products	7.5	639.0	0.7
18	Industrial equipment	8.0	135.9	0.2
19	Transport equipment	8.1	82.2	0.1
27	Cement	8.2	66.3	2.2
12	Organic chemicals	9.4	201.5	0.6
37 *	Salt	9.6	27.4	6.2
2 *	Nonferrous metals	10.1	451.8	1.0
38.4 *	Sugar refining	10.2	169.1	2.1
11.1	Chemical fertilizers	12.0	4.5	0.1
8	Coke	13.1	18.6	1.1
10	Basic chemicals	13.9	581.9	1.2
1 *	Ferrous metals	14.2	435.7	0.7
39.1	Synthetic textiles	14.3	4.0	0.1
7.2	Petroleum refining and processing	14.6	1,382.8	1.9
3.5 *	Electric power	34.0	0.0	0.0
7.1 *	Petroleum extraction	41.7	3,182.9	1.1
4 *	Hydroelectricity	49.9	0.0	0.0

[a] * = Industries utilizing China's abundant resources.

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The results of our analysis of the 1981 data differ from those we obtained in a less comprehensive study of the available data for 1979.[13] The 1979 data indicated that China's exports varied positively with the capital intensity of the industry. This was consistent with our presumption that the Chinese, operating under the "labor theory of value," did not adequately account for capital, land, and resources costs and hence underpriced items that employed these factors, while overpricing labor-intensive goods. If that were true, we could easily explain the observed pattern of foreign trade as a response to irrational price signals.

The official data for 1981 strongly suggest, however, that at least in that year the Chinese did not undervalue capital. For state-owned industrial enterprises as a whole, profits and taxes returned to the central government amounted to 92 billion Ren Min Bi (RMB), or 34 percent of the net value of fixed assets—much greater than the normal return on capital in the West (see appendix B). Furthermore, total profits and taxes were more than three times the total expenditures on wages for those state-owned units. Quite unlike industry in the West, where wages are generally the largest proportion of total costs, in China, wages were only 10 percent of costs. Thus we cannot automatically assume that Chinese methods of price formation are consistently biased against capital and in favor of labor. Indeed, our empirical findings for 1981 suggest that China has achieved a degree of rationality in foreign trade indicative of an economic system where prices reflect true costs.

On a different score, however, our cross-sectional data indicate that in 1981 China still was not taking full advantage of the potential gains from international trade. Those gains consist of two parts: one depending on the possibility for exchange, the other on the possibility for specialization in production (see appendix E). More than 30 percent of China's export pattern was explained by the pattern of domestic production. As domestic output of a particular industry increased, so did exports. Domestic output, however, was positively correlated with capital intensity, a reflection of the demands of China's central planners for more capital-intensive goods. By failing to specialize in the production of labor-intensive goods, China was not maximizing the gains from international trade. Indeed, by tending to specialize in the production of capital-intensive goods, China probably failed to obtain most of the gains that international trade has to offer.

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Nevertheless, China appears to be making progress. During the current five-year plan, Beijing's priorities are:

- Renovation of existing facilities, particularly small projects that require less investment, yield quick returns, and generate a stream of foreign exchange earnings.
- Exploration and development of energy resources, especially power, coal, and oil.
- Construction and expansion of transport and communications facilities, especially railways, ports, and telecommunications systems. This will reduce internal costs so as to make all industries more competitive in the world market.

The ongoing readjustments and reform of the economic system that began in late 1978 are leading China to increased production of labor-intensive, light industrial goods, consistent with China's comparative advantage. Ultimately, this will promote a more thorough integration of China into the world economic system.

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Implications

For China. We have used our model of China's trade to analyze the probable impact of changes in domestic production factors on the commodity composition of China's exports during the current five-year plan (1981-85). The particular factors we have examined in

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[13] In our cross-sectional analysis of 1979 data we used investment per laborer as a proxy for capital stock per laborer, since data on the net value of fixed assets were not available. Our estimated regression equation was:

$$X = -144.92 + 20.588\,(I/L) + .02937\,(V)$$

where: I/L = investment per worker in thousand RMB
X = exports, in million US $
V = GVIO, in million RMB.

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Table 5
China: Impact of Five-Year Plan Targets on Predicted Export Share of World Market [a]

Percent

Branch of Industry	Estimated Average Annual Growth Rates (1982-85)			Chinese Export Share of World Market	
	Labor	Capital Stock	GVIO	Annual Growth Rates (1982-85)	1981 Share
Metallurgical	1.4 to 4.1	3.8 to 5.6	2.8	−4.5 to 0.8	0.80
Power	6.5 to 6.9	7.0 to 8.2	4.0	Positive [b]	0
Coal	2.4 to 2.7	7.0 to 10.7	3.5	−1.7 to −0.4	1.59
Petroleum	4.3 to 10.7	7.0 to 14.9	0.7	−19.6 to 9.8	1.23
Chemical	2.4 to 2.7	4.8 to 5.0	4.0	−8.9 to −5.7	0.91
Machine building	2.8 to 3.5	−3.0 to 1.0	6.9	0.3 to 6.6	0.30
Building materials	0.6 to 1.1	0.5 to 6.0	5.4	0.1 to 2.3	1.42
Forest	2.1 to 4.4	5.0 to 10.6	0.9	−1.9 to −0.1	1.88
Food	6.8 to 9.4	4.4 to 5.0	3.0	0.8 to 1.3	2.68
Textiles	13.3 to 14.4	4.5 to 6.0	5.0	2.5 to 2.7	7.39
Clothing	13.3 to 21.6	4.5 to 4.6	6.0	1.4 to 1.8	6.37
Leather and fur	11.2 to 13.3	3.0 to 4.4	5.0	1.7 to 2.1	3.00
Paper and educational articles	−1.6 to 4.2	4.0 to 4.5	1.6	−3.7 to 0.3	1.21
Other	−1.6 to −1.8	5.0 to 32.0	4.3	−44.2 to −1.6	5.04

[a] Growth rates for capital stock and GVIO are estimated from official data on the five-year plan. Growth rates for number of laborers are based on the rate of growth in 1981 and the average annual growth rate for 1977-81. The projections for change in China's export share of the world market assume that the state share of production and the resource intensity of each industry remains constant.
[b] From a zero share to a positive share.

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the model explain about 60 percent of the variation in China's commodity trade patterns. A host of other factors account for the remaining variation in China's export shares of the world market, including changes in international supply and demand, regional considerations such as domestic and international transport costs, irrational internal pricing, national security considerations, and even local and international politics. Our projections assume these factors remain constant.

Table 5 presents two scenarios for the growth of China's exports, based on China's current five-year plan targets for output and likely trends in the growth of capital and labor. "Predicted" Chinese export shares of the world market for 1985 were compared with the predicted shares for 1981, and the annual percentage gains over the four years are presented. The low end of the range for export growth is always associated with the higher capital growth figures.

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On the basis of Chinese supply-side factors alone, our model suggests that exports of the machinebuilding industry will show the fastest growth between 1981 and 1985 (as much as a 29-percent increase in China's share of the world market). The industry will become more labor intensive, especially if the capital stock

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declines. This factor alone should reduce real costs (as producers shift away from using relatively expensive capital) and make exports more competitive. Nevertheless, laborers within this industry are becoming more productive—despite the declining capital available to them—because of improvements in technology and in the skills of the workforce. As a result, output is scheduled to increase more than in any other industry, providing further impetus to exports.

Although China's export share of the world market for machinery should show the largest percentage growth, the textile and clothing sectors should provide a slightly larger boost to export earnings. China's share of the world market for these products should increase by about 8 to 10 percent over the current shares. Most of the increase will be caused by increasing labor intensity in these two industries and, as a result, the decline in real costs per unit of output. These industries are slated to absorb a sizable share of the estimated 100 million workers that will have entered the labor force between 1980 and 1985.

Our model is most pessimistic with regard to the prospects for exports of petroleum, predicting that China's export share of the world market could decline by more than 50 percent by 1985.[14] This results in part from increasing capital intensity within the industry, which will substantially increase the costs of whatever oil is recovered, and in part from the sharply declining productivity of both capital and labor. With output scheduled to increased only 0.7 percent between 1980 and 1985, the Chinese leadership will face increasing pressure to retain the oil for domestic use. Nevertheless, they will have to weigh their need for oil against their need for foreign exchange. They may want to keep exports at current levels, particularly if growing protectionism in the West reduces earnings from other commodities

For the Rest of the World. China's emergence from years of self-imposed economic isolation will lead to increasing friction, not only with the developed countries, which will be the main market for China's new exports, but also with its LDC competitors as well. During the next three years of the five-year plan, export growth will taper off from the rapid pace of the late 1970s. Nevertheless, China will be attempting to break into established markets as it adjusts its economy toward the production of labor-intensive goods and away from many capital-intensive materials, which it previously exported.

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Although China's planners clearly believe that major gains are possible from a further expansion of trade, they fear that growing protectionist sentiments abroad may hamper their efforts. Already they have encountered complaints from US manufacturers that they are dumping products as diverse as manhole covers, menthol, mushrooms, clothespins, chloropicrin, ammonium paratungstate, greige goods, and printcloth. In some of these cases the Chinese probably have a comparative advantage—based on low labor costs—and are relatively efficient producers. In other cases, the Chinese may be exporting, despite a comparative disadvantage, simply because they do not know what their real costs are. Thus far, however, we do not have any evidence that the Chinese have engaged in "predatory" pricing tactics. In fact, in at least one case—ammonium paratungstate—officials in China's MFERT were dismayed to find that local producers were undercutting foreign market prices. They felt such behavior was detrimental to China's terms of trade.

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The United States may be more affected than other developed countries by China's export drive. China's current share of the US market—at 0.7 percent—is only half its share of the world market. Although China's exports to the United States have more than doubled in the past two years, they probably still have not reached their potential. In particular, Chinese shares of the US markets for household metal products, building materials, ceramics, nonmetallic minerals, wood products (rosin, for example), processed meats, canned goods, and leather products are far less than the shares they have captured in other markets.

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China will be competing for the developed country markets in manufactures with its eight Asian rivals—South Korea, Taiwan, Hong Kong, Singapore, the

[14] Although we present an alternative scenario in which the growth of capital stock amounts to only 7 percent and China's oil exports increase almost 10 percent per year, we believe this is unlikely to occur. If the labor force grows at only 4 to 5 percent per year, rather than repeating the 11-percent growth of 1981, the resulting increase in capital intensity of the industry is likely to hold down exports.

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Philippines, Indonesia, Malaysia, and Thailand. Although the first four—the newly industrializing countries (NICs) of East Asia—are running out of unskilled laborers and must move into more capital-intensive pursuits, the rest have surplus agrarian laborers working at existence wages. For most products, China probably will not compete directly with Taiwan and South Korea—wages there have risen rapidly in the last 10 years, and the two economies have moved up into higher value-added export lines. But China's masses of unskilled laborers will hold wages down in the other six countries if those countries are to compete for markets with China. 25X1

Over the long run, even the developed countries may have difficulty accommodating China's entrance into the world markets. Currently, 20 million of China's 400 million workers—5 percent—are engaged in foreign trade work, according to official statistics. By the year 2000 that number could quadruple. Increasing competition from China in labor-intensive industries will tend to drive real wages down and the returns to capital up in the rest of the world. A major question will be, "by how much?" 25X1

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Appendix A

Statistical Methods, Sources, and Results

Beijing's recent publication of detailed information on the domestic economy enables us for the first time to examine the relationship between domestic supply-side factors and China's international trade on an industrywide basis. Our previous efforts to understand and forecast commodity trade patterns have been limited to time-series analysis and to industry-specific microeconomic studies. This study, however, presents a macroeconomic cross section analysis of trade, factors of production, industrial output, and degree of state control over industry.

Methodology

The main objective of this paper is to test the hypothesis that the commodity pattern of China's foreign trade is economically rational, as defined by the Heckscher-Ohlin trade model. That model states that a nation's "comparative advantage" in foreign trade is determined by the relative scarcity of domestic factors of production, so that imports should intensively embody the scarce domestic factors, and exports the abundant factors. Therefore, trade results from the fact that different countries have different factor endowments, with one country possessing more labor, another more capital, yet another, more resources, and so on.

The Heckscher-Ohlin theory of international trade is premised on a "perfectly competitive" world in which there are no transport costs or other impediments to trade, and in which production functions that relate inputs of labor, capital, and resources to outputs of goods behave in certain well-mannered ways. These assumptions never hold in practice, and econometric testing of the models for individual countries often leads to unexpected results. In the case of China, where prices, wages, rents, and interest rates are set by fiat and may not accurately reflect scarcity relationships, a finding that China's foreign trade did conform with the Heckscher-Ohlin model might suggest that, despite an irrational pricing mechanism, planners are making economically efficient foreign trade decisions.

To test the hypothesis that the actual pattern of China's exports reflects its comparative advantage, we have regressed the exports (and net exports) of each industry for 1981 on factor-intensity ratios for those industries. A regression relating China's exports (or net exports) to capital-labor ratios by industry will yield a negative sign if the Heckscher-Ohlin theory holds because the higher the capital intensity of an industry the less likely China should be to export the products of that industry. Similarly, a regression on an index of industries employing China's abundant resources should yield a positive sign if trade is Heckscher-Ohlin rational. We also have regressed exports on domestic production data and on the degree of state ownership. 25X1

Sources

A wide range of data are available from the *Statistical Yearbook of China, 1981,* published by the State Statistical Bureau on 44 industries for that year. For state-owned enterprises, this data includes information on the number of staff and workers, the gross and net value of fixed assets, investment in capital construction, the number of enterprises, the gross value of industrial output (GVIO) in 1970 and 1980 prices, profits, costs, and wages. Data are also available on the total GVIO of both state-owned and collective-owned enterprises for the same industries. Appendix B presents the industry data used in this study, listed according to the Chinese Industrial Code (CIC). 25X1

The Chinese have not published equivalent trade data. For that, we have relied on our own estimates from trade partner statistics, which are published in *China: International Trade, Annual Statistical Supplement* (March 83). Because the trade data in that publication are categorized according to the *Standard International Trade Classification, Revision 1,* this research required the development of a concordance system 25X1

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that would allow us to reaggregate trade data based on the CIC. That concordance system, as well as Chinese and world trade data based on it, are presented in appendixes C and D.

Unfortunately, data on inventories by industry are not available to test the proposition that the Chinese export goods that are temporarily in surplus and import goods that are needed to make up for unexpected shortfalls in domestic production. Since we do have data on the Gross Value of Industrial Output (GVIO), however, we are able to test the hypothesis that China's central planners have made an arbitrary decision that a set share of each industry's output must be exported to earn foreign exchange for the state.

Furthermore, we have a means of testing what impact the form of ownership of domestic industry has had on foreign trade. Because, in addition to total GVIO, data are available for the component of GVIO produced by state-owned enterprises, a ratio of the latter to the former provides an indicator of the degree of state-ownership of a particular industry. A regression of exports on this variable may indicate whether state or collectively owned enterprises are more likely to engage in trade.

Because we are dealing with cross-sectional data, as a practical matter it is desirable to normalize variables so that the magnitude of the individual observations are independent of the broadness or narrowness of the defined category. Otherwise, we might find that exports of a particular commodity were small, for example, not because they embodied the country's scarce factor, but because the commodity was narrowly defined. For that reason, we have divided the Chinese export and GVIO data by world trade [15] in each industrial category to obtain China's export share of the world market and China's domestic output in relationship to world trade. It is these two variables that we have used in our model.

[15] The data for 1981 world trade are derived by aggregating commodity data that have been reported to the United Nations for 48 countries. The 48 countries probably account for 90 to 95 percent of world trade.

Results

The regression equation that we have estimated for China's export share of the world market is:

$$(X/W) = \underset{(3.046)}{4.00976} - \underset{(3.390)}{.16332}\,(K/L) + \underset{(3.280)}{2.70890}\,(R) + \underset{(4.996)}{.01381}\,(V/W) - \underset{(1.642)}{.03165}\,(S)$$

where:

X/W = China's export share of world trade, in percent

K/L = Capital to labor ratio, in thousand RMB per man

R = Proxy variable (0-1) to represent resource-intensive industries

V/W = Ratio of China's GVIO to world trade, in percent

S = State-owned enterprises' share of total GVIO, in percent

(Numbers in parentheses are *t* statistics with 39 degrees of freedom. All variables are significant at the 1-percent level with the exception of our state share variable, which is significant at the 10-percent level. The coefficient of determination for the equation is .584.)

We have found clear evidence that in 1981 the pattern of China's exports behaved consistently with the Heckscher-Ohlin trade model. The negative coefficient on the capital-labor ratio (−.16332) indicates that for each additional 1,000 RMB of capital per worker required to produce a commodity, China's export share of the world market was reduced by .16 percentage point. Thus, even in the absence of a market mechanism, China's need to conserve scarce capital has been translated into an operational principle by which Chinese planners restrict exports of

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capital-intensive commodities.[16] This variable explains about 20 percent of the variation in China's export share of the world market.

A positive coefficient on the resource proxy variable (+2.70890) indicates that, all other factors being equal, China's resource-intensive exports have captured a larger share of the world market than nonresource-intensive exports. This too is in conformity with Heckscher-Ohlin rational trade behavior. In China, resources and capital tend to be complementary factors of production rather than substitutes for one another. This is reflected in a strong correlation between capital and resource-intensities of industries. The correct (opposite) signs on the coefficients of capital and resource variables indicate, though, that somehow the Chinese are able to assign opportunity costs to each for the purpose of deciding which goods to export.

The positive coefficient (+ .01381) on the GVIO variable indicates that nearly 1.4 percent of each additional unit of output is exported.[17] This of course only reflects the effects of Chinese supply-side factors with no change in international demand. Changes in China's GVIO "explain" over 30 percent of the variation in China's export share—the most influential of the four variables in our regression equation. Nevertheless, interpretation of the meaning of our results is difficult because a positive relationship between GVIO and exports can be consistent both with the Heckscher-Ohlin trade model and with an arbitrary decision rule to earmark a certain share of domestic output for export. Only if China's capital stock were to expand significantly faster than labor would output increase while exports decline. The relatively rapid expansion of capital stock through investment in heavy industry before 1979 may explain in part China's previous aversion to trade, whereas a slowdown in the growth of capital since then has been an inducement to trade. 25X1

The negative coefficient (− .03165) on the state share variable, although not as significant as the other regression coefficients, indicates that industries in which state-owned enterprises produce a large share of output tend to export less than industries in which collectives produce a large share. Every reduction of 10 percentage points in the state share of output resulted in an increase of 0.32 percentage point in the Chinese share of the world market.[18] 25X1

[16] We have also regressed net exports (exports minus imports) on the same four variables, and found less significant results. The signs on K/L, R, and V variables are significant at the 5-percent level. The coefficient on S increased, as did our confidence in that variable, indicating that it explains even more of the variation in China's imports than it did exports. A misspecification of the capital/labor ratio was probably responsible for a decline in the significance of the coefficient on that variable. The ratios that we used for the regression measure the capital intensities used to produce China's domestic output, but, if in fact China were required to produce the same bundle of goods that it imports, we believe the ratio would have been much higher, because advanced technological machinery and equipment—presumably highly capital-intensive products—account for a large share of China's imports. 25X1

[17] Our regression equation was designed so that the coefficient on the GVIO variable would in fact indicate the marginal share of output going to exports: $X_i/W_i = b_0 + b_i(V_j/W_i) + e_i$
Multiplying both sides of this equation by W_i yields the appropriate results. 25X1

[18] This regression coefficient may not tell us that state-owned industrial enterprises are in fact more likely to engage in exporting than collectives. It is entirely possible that, under China's centrally controlled foreign trade system, only the output produced by the state sector gets exported. Certain state-owned plants may be designated as "export" enterprises, or perhaps the trade corporations under the Ministry of Foreign Economic Relations and Trade show favoritism toward state enterprises. In that case, our negative coefficient may have resulted not from negative correlation between trade and state ownership but from negative correlation between trade and some other factor. Industries that are primarily state owned, for example, may produce goods that for some reason are generally not exported, but rather, consumed domestically. 25X1

In the absence of any information of this sort, however, our results would suggest that state-owned enterprises tend to export less than collectives. There could be several reasons for this: for example, state-owned enterprises may be more integrated at the national level through better communications networks. If so, they may trade more among themselves without having to rely on external markets as a vent for their surplus output. Alternatively, state-owned enterprises may not be as profit minded as enterprises that are responsible for their own profits and losses and hence do not search out potentially profitable exchanges. 25X1

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Appendix B

China: Economic Indicators, by Branch of Industry, 1981 [a]

Branch of Industry (Chinese Industrial Codes)	Workers and Staff, Yearend (thousands)	Net Value of Fixed Assets, Yearend (million RMB)	Investment, 1981 prices (million RMB)	Profits and Taxes, 1981 prices (million RMB)	Costs, 1981 prices (million RMB)	Wagebill [b] 1981 prices (million RMB)	Total GVIO, 1980 prices (million RMB)	State Share of GVIO (percent)	Capital-Labor Ratio, Yearend RMB/Man
Metallurgical industry	3,192	41,376	2,735	9,075	30,442	2,866	45,669	93.7	12,962
Ferrous metals (1)	(2,250)	31,905	1,755	6,866	22,091	(2,020)	31,378	95.1	(14,180)
Nonferrous metals (2)	(942)	9,471	980	2,209	8,351	(846)	14,291	90.9	(10,054)
Power industry	916	34,725	4,014	8,428	9,677	(733)	19,486	96.6	37,909
Hydropower (4)	(187)	9,326	1,346	1,205	1,067	(150)	3,794	NA	(49,872)
Other (3, 5)	(729)	25,399	2,668	7,223	8,610	(583)	15,692	NA	(34,841)
Coal and Coke industry	4,013	25,326	2,655	1,088	14,334	4,047	15,726	84.1	6,283
Coal (6)	3,959	24,621	2,315	971	13,486	(3,993)	14,626	84.3	6,219
Coke (8)	54	705	340	117	848	(54)	1,100	81.6	13,056
Petroleum industry	569	15,011	2,795	11,894	14,923	525	28,213	98.2	26,381
Extraction (7.1)	(247)	10,298	2,314	5,817	6,289	(228)	13,049	100.0	(41,692)
Processing (7.2)	(322)	4,713	481	6,077	8,634	(297)	15,164	97.0	(14,637)
Chemical industry	3,071	29,398	1,902	10,829	34,531	2,379	59,143	78.3	9,572
Basic chemicals (10)	(336)	4,654	245	1,495	4,312	(260)	7,176	85.4	(13,851)
Chemical fertilizers (11.1)	1,132	13,589	427	1,293	8,766	877	10,286	95.3	12,004
Chemical pesticides (11.2)	(97)	636	15	150	1,241	(75)	1,672	91.4	(6,557)
Organic chemicals (12)	(537)	5,032	702	3,268	6,878	(416)	11,956	84.3	(9,371)
Chemicals for daily use (14)	135	815	84	965	2,643	105	4,813	85.9	6,037
Chemical pharmaceuticals (13)	335	4,672	74	3,658	10,691	(646)	23,240	64.4	(5,602)
Rubber processing (15)	317		43						
Plastic processing (16)	139		225						
Chemical ore extraction (9)	(43)		87						
Machinebuilding industry	10,151	67,977	2,439	12,587	53,109	8,232	107,995	67.1	6,696
Agricultural machinery (17)	1,074	5,340	147	226	3,903	871	6,394	73.1	4,972
Industrial equipment (18)	(2,091)	16,628	437	2,540	11,858	(1,696)	19,001	79.5	(7,952)
Transport equipment (19)	(1,510)	12,211	260	1,548	8,138	(1,225)	12,420	87.5	(8,087)
Other machinery, production use (21)	(838)	4,751	218	1,074	3,832	(680)	8,103	64.9	(5,669)
Electronic apparatus (22)	1,015	5,615	506	1,152	5,236	823	11,888	68.1	5,532
Daily use metal products (25)	(626)	994	31	863	2,481	(508)	9,617	37.2	(1,588)
Production use metal products (24)	(2,523)	22,438	89	5,184	17,661	(2,429)	40,572	60.7	(7,487)
Construction machinery (20)			25						
Machinery repair industry (26)			78						
Household use machinery (23)	474		167						
Building materials industry	1,921	11,269	879	2,191	8,120	1,517	19,507	50.1	5,866
Cement (27)	752	6,142	467	1,147	4,336	594	7,235	63.7	8,167
Bricks, tile, lime, and other (28)	(354)	2,392	(194)	418	1,944	(280)	8,442	29.0	(6,757)
Glass (30)	(218)	772	59	287	600	(172)	1,166	74.8	(3,541)
Ceramics (31)	(188)	360	(29)	96	310	(148)	572	77.4	(1,915)
Nonmetallic minerals (32)	(204)	743	60	107	459	(161)	1,075	58.4	(3,642)
Fire-resistant materials	(205)	860	(70)	136	471	(162)	1,017	60.8	(4,195)
Forest industry	1,318	6,882	663	1,569	6,283	1,255	10,490	60.2	5,221
Timber felling and transport (33)	999	5,400	523	897	3,544	951	3,908	92.0	5,405
Timber processing, wood products (34)	284	1,482	113	672	2,739	270	6,582	44.6	(4,646)
Chemical wood products (35)	35		27			34			
Food industry	2,561	11,768	926	12,428	34,744	1,825	69,012	68.4	4,595
Grain and Oil (36)	(503)	2,095	(83)	801	7,709	(358)	20,398	41.7	(4,165)
Salt making (37)	(110)	1,060	56	413	479	(78)	1,981	45.0	(9,636)
Slaughtering and meat processing (38.1)	(524)	1,260	183	371	8,082	(373)	11,797	71.7	(2,405)
Canned food (38.4)	(169)	480	(19)	264	1,565	(120)	2,119	86.3	(2,840)
Sugar refining (38.4)	(223)	2,265	312	983	2,561	(159)	3,645	97.2	(10,157)
Tobacco manufactures (38.6)	(272)	583	57	6,404	3,470	(194)	10,051	98.2	(2,143)
Distilling (38.8)	(239)	1,686	124	1,598	2,852	(170)	5,259	84.6	(7,054)
Other (33.2, 38.5, 38.7, 38.9, 38.10)	(521)	2,339	(92)	1,594	8,026	(371)	13,762	69.9	(4,489)
Textile industry (39)	3,890	14,497	1,986	17,298	52,449	2,960	85,602	81.5	3,726
Chemical fibers (39.1)	207	3,009	837	1,317	3,376	158	5,346	87.8	14,536
Cotton textiles (39.3)	2,501	7,255	(726)	11,255	33,869	1,903	51,791	87.1	(2,901)
Other (39.2, 39.4-39.8)	1,182	4,233	(423)	4,726	15,204	899	28,465	70.0	(3,581)
Clothing industry (40)	152	326	16	368	2,067	112	14,724	16.5	2,144
Leather industry (41)	209	624	45	400	1,955	161	5,858	40.2	2,985
Paper making and educational articles	1,081	5,626	(266)	2,468	7,494	860	19,116	52.1	5,204
Papermaking (42)	490	3,381	(191)	1,200	4,244	390	6,940	78.4	6,900
Educational articles (43)	591	2,245	(75)	1,268	3,250	470	12,176	37.1	3,798
Other (44)	1,023	6,127	(205)	1,706	6,393	818	17,226	47.0	5,989
All industries	**34,067**	**270,932**	**21,526**	**92,329**	**276,516**	**28,291**	**517,767**	**71.2**	**7,952**

[a] The data in this table are extracted from the *Statistical Yearbook of China, 1981* (SY81). Figures in parentheses are estimated. For those industries where the data were incomplete, the number of staff and workers were estimated by a regression equation relating number of workers to costs. Predicted values were then rescaled to ensure that the components summed to known control totals. Data on number of workers and staff, net value of fixed assets, profits and taxes, costs, and capital-labor ratio refer to state-owned enterprises only.

[b] Estimated, using data provided to the United Nations by the Chinese State Statistical Bureau. Average wages per man-year for 1979, by industry, were scaled up by average wage for all industry in 1981 (from SY81), then multiplied by average man-years of labor by industry for 1981 to obtain the 1981 wage bill.

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Appendix C

China: Foreign Trade, by Branch of Industry, 1981

Million US$
Except as noted

Branch of Industry	China's Exports	China's Imports	World Trade	China's Share of World Trade *(percent)*	
				Exports	Imports
Metallurgical industry					
Ferrous metals (1)	435.7	1,396.7	66,754	.65	2.09
Nonferrous metals (2)	451.8	215.9	44,299	1.02	.49
Power industry (3, 4, 5)	0.0	18.1	2,218	.00	.82
Coal and Coke industry					
Coal (6)	249.2	101.5	15,179	1.64	.67
Coke (8)	18.6	0	1,665	1.12	.00
Petroleum industry					
Extraction (7.1)	3,182.9	36.6	300,816	1.06	.01
Processing (7.2)	1,382.8	15.8	70,966	1.95	.02
Chemical industry					
Basic chemicals (10)	581.9	514.4	49,240	1.18	1.04
Chemical fertilizers (11.1)	4.5	807.1	7,006	.06	11.52
Chemical pesticides (11.2)	17.9	96.4	3,479	.51	2.77
Organic chemicals (12)	201.5	602.9	36,150	.56	1.67
Chemicals for daily use (14)	93.9	31.5	11,526	.81	.27
Chemical pharmaceuticals (13)	189.8	28.2	32,940	1.15	.47
Rubber processing (15)	56.6	52.8			
Plastic processing (16)	39.4	40.5			
Chemical ore extraction (9)	92.3	40.5			
Machine-building industry					
Agricultural machinery (17)	6.6	27.7	10,508	.06	.26
Industrial equipment (18)	135.9	936.2	63,072	.22	1.48
Transport equipment (19)	82.2	694.0	159,658	.05	.43
Other machinery, production use (21)	141.3	1,581.2	76,635	.18	2.06
Electronic apparatus (22)	123.1	1,005.2	68,227	.18	1.47
Daily use metal products (25)	362.1	84.2	18,696	1.94	.45
Production use metal products (24)	420.6	673.7	96,967	.66	1.14
Construction machinery (20)	1.3	0.7			
Household use machinery (23)	217.1	428.2			
Building materials industry					
Cement (27)	66.3	76.4	3,072	2.16	2.49
Bricks, tile, lime, and other (28)	77.8	0.3	2,472	3.15	.01
Glass (30)	9.8	9.9	2,692	.36	.37
Ceramics (31)	29.3	2.3	3,024	.97	.08
Nonmetallic minerals (32)	48.5	11.4	1,162	4.17	.98
Fire-resistant materials	10.1	61.0	4,549	.22	1.34
Forest industry					
Timber felling and transport (33)	10.0	126.2	6,468	.15	1.95
Timber processing and wood products (34)	233.2	60.2	25,239	2.33	.24
Chemical wood products (35)	353.7	0.1			
Food industry					
Grain and oil industry (36)	614.5	137.5	13,766	4.46	1.00
Salt making (37)	27.4	0	442	6.21	.00
Slaughtering and meat processing (38.1)	380.3	0.8	17,082	2.23	.00
Canned food (38.4)	628.7	1.6	8,198	7.67	.02
Sugar refining (38.4)	169.1	484.2	7,936	2.13	6.10
Tobacco manufactures (38.6)	3.6	34.7	2,936	.12	1.18
Liquors (38.8)	39.6	8.5	7,042	.56	.12
Other (33.2, 38.5, 38.7, 38.9, 38.10)	531.9	87.9	31,859	1.67	.28
Textile industry (39)					
Chemical fibers (39.1)	4.0	758.9	4,072	.10	18.63
Cotton textiles (39.3)	933.3	72.9	5,008	18.64	1.46
Other (39.2, 39.4-39.8)	1,819.2	1,467.4	28,226	6.45	5.20
Clothing industry (40)	2,013.7	41.2	31,602	6.37	.13
Leather industry (41)	516.2	133.9	17,216	3.00	.78
Papermaking and educational articles					
Papermaking (42)	174.0	428.7	33,348	.52	1.29
Educational articles (43)	690.4	80.1	37,895	1.82	.21
Other (44)	965.8	97.6	19,150	5.04	.51
Total	**18,839.4**	**13,607.8**	**1,431,308**	**1.32**	**.95**

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Appendix D

Concordance of the Chinese Industrial Code With the Standard International Trade Classification, Revision 1

Branch of Industry	SITC, Revision 1
I. Metallurgical Industry	
1 Ferrous metals	281, 282, 67
2 Nonferrous metals	283, 286, 68
II. Power Industry	35
3, 5 Thermal power, power supply (distribution)	
4 Hydroelectric power	
III. Coal and Coke Industry	
6 Coal	3214, 3217
8 Coking and coke chemistry	3218
IV. Petroleum Industry	
7.1 Petroleum extraction	331, 34
7.2 Petroleum processing	332
V. Chemical Industry	
9 Chemical ore extraction	271, 274, 2769
10 Basic chemicals raw materials	51, 5999
11.1 Chemical fertilizer	56
11.2 Agricultural pesticides	5992
12 Organic chemicals	28, 53, 58, 5995, 5997
13 Pharmaceuticals	54
14 Daily use chemicals	55, 862
15 Rubber processing	2312, 62
16 Plastics processing	893
VI. Machinebuilding Industry	
17 Agricultural machinery	712
18 Industrial equipment	711, 715, 717 (less 7173), 718 (less 71841)
19 Communications equipment	731, 732, 734, 735
20 Construction and road-building machinery	71841
21 Industry manufacturing other machinery for production use	719 (less 7194), 861 (less 8614, 8617), 951
22 Electronics	724, 726, 729 (less 7291, 7292), 8911, 8912
23 Household use machinery	714, 7173, 7194, 725 (less 72501, 72503), 733, 8614, 8617, 864
24 Production use metal products	691, 695, 722, 723, 7291, 7292
25 Daily use metal products	696, 698, 72501, 72503, 812
26 Machinery equipment, and metal products repair	
VII. Building Materials Industry	
27 Cement	6612, 6618, 6638
28 Brick, tile, lime, and other construction materials	273, 6611, 6613, 66241, 66242
29 Fire-resistant materials	2762, 2764, 6623, 6634, 6637
30 Glass	664 (less 6648)
31 Ceramics	66243, 66245, 6631, 6632, 6639
32 Nonmetallic ores	275, 2761, 2765, 2766
VIII. Forest Industry	
33 Timber felling and transport	241, 242
34 Timber processing	243, 244, 63, 82
35 Wood products chemistry	5996
IX. Food Industry	
36 Grain and oil	0422, 046, 048, 41, 43
37 Salt	2763
38.1 Butchering and meat processing	01
38.3 Canning	053, 0546, 0549, 055
38.4 Sugar manufacturing	06
38.6 Cigarettes	122
38.8 Distilling	112
Other (38.2, 38.5, 38.7, 38.10)	02, 03 (less 031), 07, 09, 111 (less 11101), 121
X. Textile Industry (39)	
39.1 Chemical fiber	266, 267
39.3 Cotton textiles	652
Other (39.2, 39.4-39.8)	65 (less 652, 654, 657)
XI. Clothing Industry	
40 Sewn goods	841
XII. Leather and Fur Industry	
41 Fur and leather	61, 831, 842, 851
XIII. Papermaking and educational articles	
42 Paper making	251, 64
43 Industry manufacturing products for educational, cultural, and arts use	654, 657, 667, 863, 8914, 8919, 892, 894, 897
XIV. Other	
44 Other	11101, 08, 571, 6648, 665, 666, 899, 961

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Appendix E

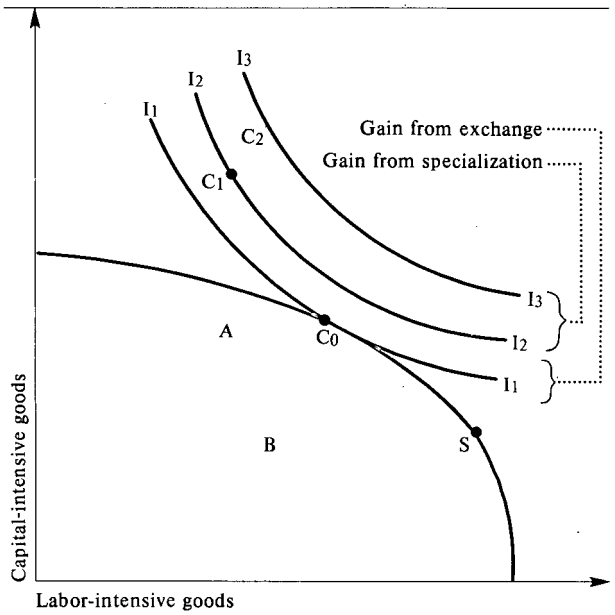
The Gains From International Trade

The gains from international trade consist of two parts: one depending on the possibility for exchange, the other on the possibility for specialization in production. Figure 4 illustrates these gains using the standard production possibility and indifference curve techniques. In isolation, China produces and consumes at point C_0. Once trade begins, if China does not change its pattern of production it would continue producing at C_0 but still could gain from trade. By exchanging AC_0 of its labor-intensive goods for AC_1 of the rest of the world's capital-intensive goods at the world price ratio, P_w, China could move from indifference curve I_1 to I_2, which represents a higher level of utility than does I_1. The gains from exchange could thus be said to consist of the movement from C_0 to C_1.

[redacted]

This, however, would not represent an optimal situation because the ratio of transformation in production at C_0 is not equal to the ratio of substitution in consumption at C_1. Therefore, China would be better off by specializing more in the production of labor-intensive goods by moving to S, and from there, trading to C_2. The move from C_1 to C_2 (or to indifference curve I_3) can be said to represent the gain from specializing in production [redacted]

Figure 4
Economic Benefits of Trade



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